

CLAIMS

We claim:

1. A method of manufacturing metal wire rod for use in plastic working comprising:
 - a. cleaning metal wire rod by at least one cleaning process for 20 seconds or less;
 - b. contacting the metal wire rod with an aqueous, lubricating-coating formation processing liquid comprising:
 - i. at least one inorganic salt, and
 - ii. at least one lubricant, wherein the solid matter weight ratio of said lubricant to said inorganic salt is within the range of 0.1 to 4.0, for 5 seconds or less,
 - c. forming a lubricant film on the metal wire rod by drying the metal wire rod immediately after step (b);wherein all steps are in a continuous inline system.
2. The method of manufacturing metal wire rod for use in plastic working of claim 1 further comprising the step of pre-heating the metal wire rod prior to contacting with the aqueous, lubricating-coating formation processing liquid in step (b).
3. The method of manufacturing metal wire rod for use in plastic working of claim 1 wherein the inorganic salt is selected from the group consisting of phosphates, sulfates, borates, silicates, molybdates, and tungstates.

4. The method of manufacturing metal wire rod for use in plastic working of claim 3 wherein the lubricant is selected from the group consisting of metal soaps, waxes, poly-tetrafluoroethylene, molybdenum disulfide, and graphite.
5. The method of manufacturing metal wire rod for use in plastic working of claim 4 wherein the lubricant film has a coating weight of 0.5-20 g/m².
6. The method of manufacturing metal wire rod for use in plastic working according to Claim 5, wherein the metal wire rod has a diameter of 0.3–50 mm.
7. The method of manufacturing metal wire rod for use in plastic working according to Claim 1, wherein the line speed for continuous processing of the metal wire rod is in the range of 10- 150 m/minute.
8. The method of manufacturing metal wire rod for use in plastic working according to Claim 4, wherein the aqueous, lubricating-coating formation processing liquid further comprises one or more surfactants selected from the group consisting of nonionic surfactants, anionic surfactants, amphoteric surfactants, and cationic surfactants.
9. The method of manufacturing metal wire rod for use in plastic working according to Claim 5, wherein the solid matter weight ratio of said lubricant to said inorganic salt is within the range of 0.2 to 1.5.
10. The method of manufacturing metal wire rod for use in plastic working of claim 1, wherein the at least one cleaning process is selected from the group consisting of shot blasting, sand blasting, bending, anodic pickling, and cathodic pickling.

11. The method of manufacturing metal wire rod for use in plastic working of claim 1, wherein said metal wire rod is metal selected from the group consisting of iron, steel, stainless steel, aluminum, aluminum alloy, magnesium, magnesium alloy, titanium, titanium alloy, copper, and copper alloy.
12. The method of manufacturing metal wire rod for use in plastic working according to Claim 11, wherein the line speed for continuous processing of the metal wire rod is in the range of 10- 150 m/minute.
13. A method of manufacturing metal wire rod for use in plastic working comprising:

cleaning, coating and drying said metal wire rod in a continuous inline system, said system comprising the steps of:
 - a. cleaning metal wire rod by at least one cleaning process for 20 seconds or less;
 - b. preheating the metal wire rod and contacting said metal wire rod with an aqueous, lubricating-coating formation processing liquid comprising:
 - i. at least one inorganic salt selected from the group consisting of phosphates, sulfates, borates, silicates, molybdates, and tungstates, and
 - ii. at least one lubricant selected from the group consisting of metal soaps, waxes, poly-tetrafluoroethylene, molybdenum disulfide, and graphite, for 5 seconds or less,
 - c. forming a lubricant film with a coating weight of $0.5\text{-}20\text{ g/m}^2$ on the metal wire rod by drying the metal wire rod immediately after step (b).

14. The method of manufacturing metal wire rod for use in plastic working according to Claim 13, wherein the metal wire rod has a diameter of 0.3–50 mm.
15. The method of manufacturing metal wire rod for use in plastic working according to Claim 13, wherein the line speed for continuous processing of the metal wire rod is in the range of 10- 150 m/minute.
16. The method of manufacturing metal wire rod for use in plastic working according to Claim 13, wherein the aqueous, lubricating-coating formation processing liquid further comprises one or more surfactants selected from the group consisting of nonionic surfactants, anionic surfactants, amphoteric surfactants, and cationic surfactants.
17. The method of manufacturing metal wire rod for use in plastic working according to Claim 13, wherein the solid matter weight ratio of said lubricant to said inorganic salt is within the range of 0.1 to 4.0.
18. The method of manufacturing metal wire rod for use in plastic working according to Claim 17, wherein the solid matter weight ratio of said lubricant to said inorganic salt is within the range of 0.2 to 1.5.
19. The method of manufacturing metal wire rod for use in plastic working of claim 13, wherein the at least one cleaning process is selected from the group consisting of shot blasting, sand blasting, bending, anodic pickling, and cathodic pickling.

20. The method of manufacturing metal wire rod for use in plastic working of claim 13, wherein said metal wire rod is metal selected from the group consisting of iron, steel, stainless steel, aluminum, aluminum alloy, magnesium, magnesium alloy, titanium, titanium alloy, copper, and copper alloy.